10-5
Base e and the Natural Log

$$e = \lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = 2.71828$$

n	e
1	$(1+\frac{1}{1})^1 = 2$
10	$(1+\frac{1}{10})^{10} = 2.5937$
100	2.7048
1000	2.7169
10,000	2.7181

$\log_e x = \ln x$

Exponential Form	Logarithmic Form
$e^{2.64} = 14$	ln 14 = 2.64
$e^{3.09} = 22$	ln 22 = 3.09
$e^{-1.1} = 1/3$	$\ln \frac{1}{3} = -1.1$
$e^{\frac{1}{5}} = 1.22$	ln 1.22 = 1/5
$e^4 = 54.6$	$\ln 54.6 = 4$

Simplify:

$\log_2 2^4 = 4$

$\ln e^4 = 4$

$e^4 = e^4$

$\ln e^4 = 4$

$\ln e^2 = 2$

$\ln \frac{1}{e^3} = -3$

Simplify:

$\ln 1 = y$

$e^y = 1$

$y = 0$

$\ln 1 = 0$

$\ln \sqrt{e} = 1/2$

$\ln e = 1$

Simplify:

$2^{\log_2 5} = 5$

$e^{\ln 17} = 17$

$e^{\ln 21} = 21$

$\ln e^{4x+3} = 4x+3$

Solve

$\ln 3x = 2$

$e^2 = 3x$

$\frac{e^2}{3} = \frac{3x}{3}$

$2.463 = x$

Solve

$\ln(x-5) = 4$

$e^4 = x - 5$

$e^4 + 5 = x$

$59.598 \approx x$

Solve

$\ln 2x + \ln x = \ln 8$

$\ln x = y \quad e^y = x$

$\ln 2x^2 = \ln 8$

$2x^2 = 8$

$x^2 = 4$

$x = \pm 2$

(2)

Solve

$e^{4x} = 24$

$\ln e^{4x} = \ln 24$

$4x \ln e = \ln 24$

$4x(1) = \ln 24$

$4x = \ln 24$

$x = \frac{\ln 24}{4} = .7945$

If interest is compounded continuously, use the formula:

$A = Pe^{rt}$

A = amount
P = principal
r = rate
t = time

$A = Pe^{rt}$

If $1,000 is compounded continuously at 6% interest:

- How much money would there be in one year?
- How much money would there be in 8 years?

$A = 1000e^{.06(1)}$ $\$1061.84$

$A = 1000e^{.06(8)}$ $\$1616.07$

How long would it take that same principal to reach at least $1350.

$1350 = 1000e^{(.06t)}$

$1.35 = e^{.06t}$

$\ln 1.35 = \ln e^{.06t}$

$\ln 1.35 = .06t$

$5 \text{ yrs} \approx t$

HW
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30-51 x3, 28, 54, 58, 59